GASTRIC ULCERS IN RATS CAUSED BY RESTRAINT IN A METAL TUBE

By R. Lambert, M. S. Martin and F. Martin

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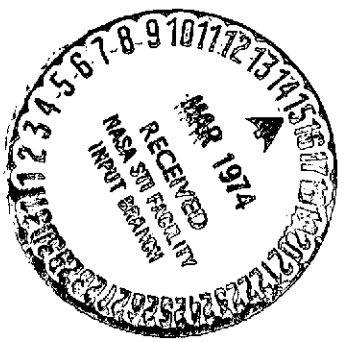

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16. Abstract

Proof was gathered that conditions of restraint in a metal tube can cause gastric ulcers in rats. The female rat proved to be more susceptible to ulcers than the males.

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GASTRIC ULCERS IN RATS CAUSED BY RESTRAINT IN A METAL TUBE

By R. Lambert, M. S. Martin and F. Martin[1]

Since the works of Bonfils [1], immobilization in metal grillwork is a technique widely used to produce gastric ulcers in rats. The frequency of ulcers is modified by many factors, i.e., duration of restraint, volume of restriction, sex and age of the animal. We have recently emphasized the influence of less obvious factors, i.e., origin of the animal for those of same race, season of the year [2]. Respecting all of these conditions does not yet totally guarantee the uniformity of the experimental procedure. There are indeed variation factors belonging to the method itself. The positioning of the animal in the grillwork requires a short narcosis which can affect the later behavior of the rat. It is difficult to produce a perfectly reproducible pressure around the body of the animal by pressing the grillwork down on the latter. In some animals, the grillwork causes cutaneous injuries at the root of the limbs or an edema by venous stasis. Other techniques of restraint have been proposed [1], i.e., plaster cocoon, metal grillwork fastened on a board, metal sheath around the body of the animal fastened by clamps. All the latter techniques avoid tying of the animals paws. We used a special method of restraint involving the restriction of movements in a metal cylinder. Such cylinders were used for a time by Brodie [3] who was kind enough to loan us a tube to be used as a model. /816*

Method

We used 104 rats of Wistar strain including 61 males and 53 females weighing between 150 and 200 g. /817

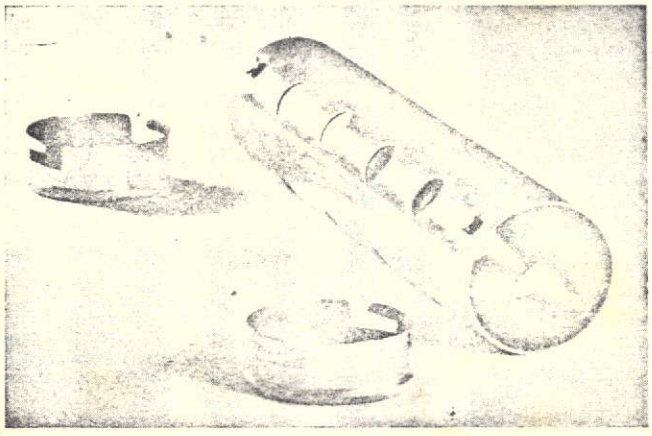
[1] (INSERM, Digestive Physiopathology Unit, U. 45 Prav. H Hôpital Edouard-Herriot, Lyon, Clinique Médicale A, Faculté de Médecine [Director: M. Levrat], Lyon).

*Numbers in the margin indicate pagination in the foreign text.

The restraint was performed in cylindrical metal tubes with both ends closed off by a flexible lid. The body of the cylinder was pierced with holes allowing ventilation. Five calibers of tubes were used depending on the weight of the rat (cf. figure).

Note, by way of example, that the volume occupied by a rat weighing 159 g is about 175 cm^3.

The rats were introduced spontaneously into the tubes when both ends were open. No anesthesia was necessary.



Photograph of a Restraining Tube for Rats Weighing 160 to 169 g.

The tubes were then placed on two wedges in a box measuring about 30 x 15 x 20 cm without lid in order to obtain a very uniform environment and the isolation of each animal. The restraint was carried out for a period of 24 hours. The animal was not kept at fast and received no liquid by the parenteral method.

Poids du rat	Calibre du tube		
	Longueur	Diam. interne	Volume interne
150-159 g	209 mm	40 mm	262,5 cm^3
160-169 g	»	41 mm	275,4 cm^3
170-179 g	»	44 mm	317,4 cm^3
180-189 g	»	46 mm	347,1 cm^3
190-199 g	»	48 mm	377,8 cm^3

Note: Commas indicate decimal points.

Cailiber of the Metal Cylinders Used for the Restraint Depending on the Weight of the Rat; b, Weight of Rat; c, Length; d, Tube Caliber; e, Inside Diameter; f, Inside Volume.

Findings

We found out of 104 rats subjected to restraint 74 cases of ulcers or a rate of 71%. The results according to sex confirmed the greater sensitivity of the female: 31 ulcerous animals for 61 males (62%) and 36 ulcerous animals for 43 females (84%). /818

Discussion

The method of constraint using a tube appears to offer important advantages and investigate the pharmacodynamic influences on the frequency of the acute ulcer. The absence of narcosis allows avoiding the interference caused by the anesthetic. The volume of restriction is constant for a given caliber and the containing capability is very uniform owing to the rigidity of the cylinder. It is still necessary to utilize rats whose weight corresponds to the scale of the tube. The animal immobilized in the tube and placed in an almost closed container is sheltered from sensorial stimulations in a far stricter manner than afforded by the conventional technique.

Some disadvantages of the method should be pointed out. The emotional state of the rat while being restrained is reflected in abundant defecation activity which can make the animal disagreeable to handle upon leaving the tube. The rat under restriction is accessible with difficulty in the cylinder and handling activity such as injection, collection of secretion and physiological recordings are more difficult.

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